Magnetoliposomes based on manganese ferrite/gold nanoparticles for applications in cancer therapy

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The potential of superparamagnetic nanoparticles for biomedical applications has been recognized, considering their size, physicochemical properties and strong magnetization only when an external magnetic field is applied. The coverage of magnetic nanoparticles with a lipid bilayer (magnetoliposomes) improves biocompatibility, preserving the magnetic properties, while providing the ability to transport drugs. Recently, magnetic nanoparticles of manganese ferrite covered with a lipid bilayer were developed for drug delivery [1,2]. Plasmonic gold nanoparticles exhibit strong photothermal effects, producing local heat that can be exploited for hyperthermia and controlled drug release applications. The combination of these effects with a superparamagnetic behavior makes possible the development of multifunctional nanosystems with the capabilities of magnetic guidance, hyperthermia and drug delivery, with promising applications in cancer therapy.

In this work, different types of magnetic/plasmonic $MnFe_2O_4$/Au nanoparticles were prepared, including core-shell and decorated nanoparticles (Fig. 1A). The structural, spectroscopic and magnetic properties were evaluated. The nanoparticles were covered with a lipid bilayer or entrapped in liposomes. These systems were successfully tested as nanocarriers for a potential anticancer drug (Fig. 1B), especially active against melanoma, breast adenocarcinoma and non-small cell lung cancer.

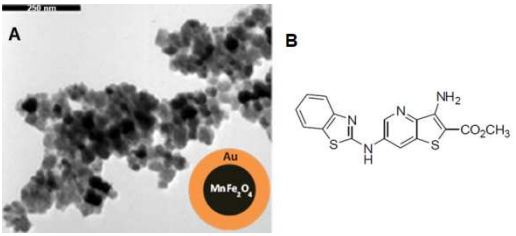

Figure 1. A: TEM image of $MnFe_2O_4$/Au nanoparticles. **B**: Structure of the anticancer drug.

References

1. A. R. O. Rodrigues *et al.*, *RSC Adv.* **6**, 17302-17313 (2016).
2. A. R. O. Rodrigues *et al.*, *RSC Adv.* **7**, 15352-15361 (2017).